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Indian Standard

INSTANT TEA — DETERMINATION OF FREE-FLOW AND COMPACTED BULK DENSITIES

UDC 663·95 : 531·755·24

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

December **1993** **Price Group 3**

Stimulant Foods Sectional Committee, FAD 23

NATIONAL FOREWORD

This Indian Standard which is identical with ISO 6770 : 1982 'Instant Tea — Determination of free-flow and compacted bulk densities' issued by the International Organization for Standardization (ISO) was adopted by the Bureau of Indian Standards on the recommendation of the Stimulant Foods Sectional Committee (FAD 23), and approval of the Food and Agriculture Division Council.

In the adopted standard certain terminology and conventions are not identical with those used in Indian Standards; attention is drawn specially to the following:

a) Wherever the words 'International Standard' appear, referring to this standard, they should be read as 'Indian Standard'; and

b) Comma (,) has been used as a decimal marker, while in Indian Standard the current practice is to use point (.) as the decimal marker.

CROSS REFERENCES

The technical committee responsible for the preparation of this standard has reviewed the provisions of the following ISO standard and has decided that it is suitable for use in conjunction with this standard:

ISO 787/11, 'General methods of test for pigments and extenders — Part 11 : Determination of tamped volume and apparent density and tamping'.

In reporting the result of a test or analysis made in accordance with the standard, if the final value, observed or calculated is to be rounded off, it shall be done in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'.

IS 13858 : 1993
ISO 6770 : 1982

Indian Standard

INSTANT TEA — DETERMINATION OF FREE-FLOW AND COMPACTED BULK DENSITIES

0 Introduction

A knowledge of the bulk density of instant tea is essential to trade in that commodity for it determines the volume occupied by a given mass and hence is an important factor in filling jars correctly for retail sale, and for controlling the mass of instant tea delivered from vending machines.

Bulk density is defined as the ratio of mass to volume. The volume of a given sample of instant tea varies according to its history of handling, due to compaction (reversible) and powder breakdown (irreversible) effects. Bulk densities can be expressed in two ways : free-flow (or uncompacted) density and tapped (or compacted) density.

Instant tea is fragile and subject to irreversible powder breakdown effects which may occur with repetitive determination of compacted bulk density. Because both densities (and in particular the compacted density) depend so critically on the methods used for handling, it is particularly important that the methods adopted for their measurement be as simple and as little dependent on the human factor as possible. It is also important that any mechanical apparatus needed is standardized, cheap, and easily available throughout those parts of the world where instant tea is produced or sold.

1 Scope and field of application

This International Standard specifies two methods for the determination of the bulk density of instant tea :

a) free-flow bulk density (section one);

b) compacted bulk density (section two).

2 Reference

ISO 787/11, *General methods of test for pigments and extenders — Part 11 : Determination of tamped volume and apparent density after tamping.*

Section one : Determination of free-flow bulk density

3 Definition

free-flow bulk density (of instant tea) : The ratio of the mass of instant tea to the volume it occupies after it has been tipped freely into a container under specified conditions.

It is expressed in grams per millilitre (g/ml).

4 Principle

Pouring a sample from a specified funnel into a specified receptacle of known volume, and weighing the contents of the receptacle.

5 Apparatus

5.1 Balance, capable of weighing to the nearest 0,1 g.

5.2 Apparatus for determination of free-flow bulk density, having the dimensions shown in figure 1, and consisting of :

5.2.1 Firmly mounted funnel, fitted with a slide.

5.2.2 Removable, spoutless measuring receptacle.

The capacity to the brim shall be known to the nearest millilitre.

NOTE — Those parts of the apparatus which may come into contact with the sample shall be made of stainless steel.

5.3 Spatula, approximately 120 mm × 20 mm, or other suitable scraper.

6 Sampling

6.1 Carefully take three test samples from the top, middle and bottom of the bulk sample and store them in rigid containers. Samples shall never be kept in plastic bags where they are vulnerable to compression.

6.2 Turn the jars carefully to check for lumps. The samples shall not be worked, since this can alter their characteristics.

7 Procedure

7.1 Weigh the measuring receptacle (5.2.2) to the nearest 0,1 g.

With the slide closed, pour into the funnel (5.2.1) a quantity of one of the samples of instant tea such that it is greater than that needed to fill the measuring receptacle. Fully open the slide of the funnel so that the contents discharge into the measuring receptacle in 6 to 12 s.

NOTE — If the sample does not flow freely, keep the outlet clear by inserting a rod of diameter 3 to 4 mm into the opening.

When the receptacle is overflowing, close the slide of the funnel and level off the surplus powder using a single stroke with the spatula or other suitable scraper (5.3). Avoid accidental tapping or vibration of the filled measuring receptacle.

Remove the measuring receptacle from below the funnel and weigh it and its contents to the nearest 0,1 g. Subtract the mass of the measuring receptacle to obtain the mass of sample it contains.

7.2 Carry out two separate determinations, in rapid succession, on duplicate portions of the same test sample and repeat these determinations on the other two test samples (6.1).

8 Expression of results

8.1 Method of calculation and formula

The free-flow bulk density, expressed in grams per millilitre, is equal to

$$\frac{m}{V}$$

where

m is the mass, in grams, of sample contained by the measuring receptacle (see 7.1);

V is the capacity, in millilitres, to the brim, of the measuring receptacle.

Take as the result the arithmetic mean of the values obtained in the two separate determinations (7.2) on each test sample, provided that the requirement for repeatability (see 8.2) is satisfied.

Record separately the result obtained for each of the three test samples taken from the bulk sample.

8.2 Repeatability

The difference between the values obtained in the two separate determinations (7.2), carried out in rapid succession by the same operator on the same test sample, shall not exceed 2 % of the mean.

9 Test report

The test report shall show the method used and the results obtained. It shall also mention any operating details not specified in this International Standard or regarded as optional, as well as any circumstances that may have influenced the result. It shall note, in particular, any lumps observed in the samples.

The test report shall include all the information necessary for the complete identification of the bulk sample.

Section two : Determination of compacted bulk density

10 Definition

compacted bulk density (of instant tea) : The ratio of the mass of instant tea to the volume it occupies after it has been subjected to a number of taps (usually 100) under specified conditions.

It is expressed in grams per millilitre (g/ml).

11 Principle

Determination of the volume of a given mass of instant tea after a fixed number of taps (usually 100) in a jogging volumeter.

12 Apparatus

12.1 Balance, capable of weighing to the nearest 0,1 g.

12.2 Powder funnel, of stainless steel or other suitable material.

12.3 Jogging volumeter, as described in ISO 787/11 (see also figure 2), comprising :

12.3.1 Graduated measuring cylinder, made of glass, of capacity 250 ml, having a mass of 220 ± 40 g, and graduated at every 2 ml.

NOTE — If convenient, a measuring cylinder of different mass may be used provided that the total mass of the cylinder and holder (12.3.2) is 670 ± 45 g.

12.3.2 Holder, for the measuring cylinder (12.3.1), with a shaft, and of mass 450 ± 5 g.

12.3.3 Cam, which lifts the shaft pestle and measuring cylinder once per revolution and has a frequency of rotation of 250 ± 15 min^{-1}.

12.3.4 Anvil, on which the raised shaft falls from a height of 3 ± 0,1 mm.

12.3.5 Revolution counter, to count the number of revolutions of the cam.

12.3.6 Sleeve, to guide the shaft, constructed of a suitable material to give minimum friction.

NOTE — The apparatus should be so constructed that, without undue free play, the friction between the shaft and the sleeve is as low as possible without the use of a lubricant.

13 Sampling

13.1 Carefully take three test samples from the top, middle and bottom of the bulk sample and store them in rigid containers. Samples shall never be kept in plastic bags where they are vulnerable to compression.

13.2 Turn the jars carefully to check for lumps. The samples shall not be worked, since this can alter their characteristics.

14 Procedure

14.1 Set the jogging volumeter (12.3) to give 100 taps and weigh the measuring cylinder (12.3.1) to the nearest 0,1 g.

By means of the powder funnel (12.2)[1], transfer about 150 ml of one of the samples to the cylinder. Weigh the cylinder and its contents, and subtract the mass of the cylinder to obtain the mass of sample it contains. Fit the cylinder to the jogging volumeter with the holder (12.3.2). Allow the volumeter to tap 100 times. Read the volume of the powder on the cylinder graduations to the nearest 2 ml.

14.2 Carry out two separate determinations, in rapid succession, on duplicate portions of the same test sample and repeat these determinations on the other two test samples (13.1).

14.3 In cases where there are doubts about powder fragility, the volume may be determined after a number of 50 tap sequences to establish whether there is a limiting minimum volume, or whether the volume diminishes continuously. In the latter case, record all the volumes measured. By agreement between the interested parties, the compacted bulk density may be recorded as that derived from the volume after the first 100 taps.

15 Expression of results

15.1 Method of calculation and formula

The compacted bulk density, expressed in grams per millilitre, is equal to

$$\frac{m}{V}$$

where

m is the mass, in grams, of sample in the measuring cylinder;

V is the volume, in millilitres, occupied by the sample after compaction.

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[1] It is possible that filling the cylinder through a powder funnel may influence the results; some experimentalists maintain that the powder should be poured directly from the sample jar into the cylinder.

Take as the result the arithmetic mean of the values obtained in the two separate determinations (14.2) on each test sample, provided that the requirement for repeatability (see 15.2) is satisfied.

Record separately the result obtained for each of the three test samples taken from the bulk sample.

15.2 Repeatability

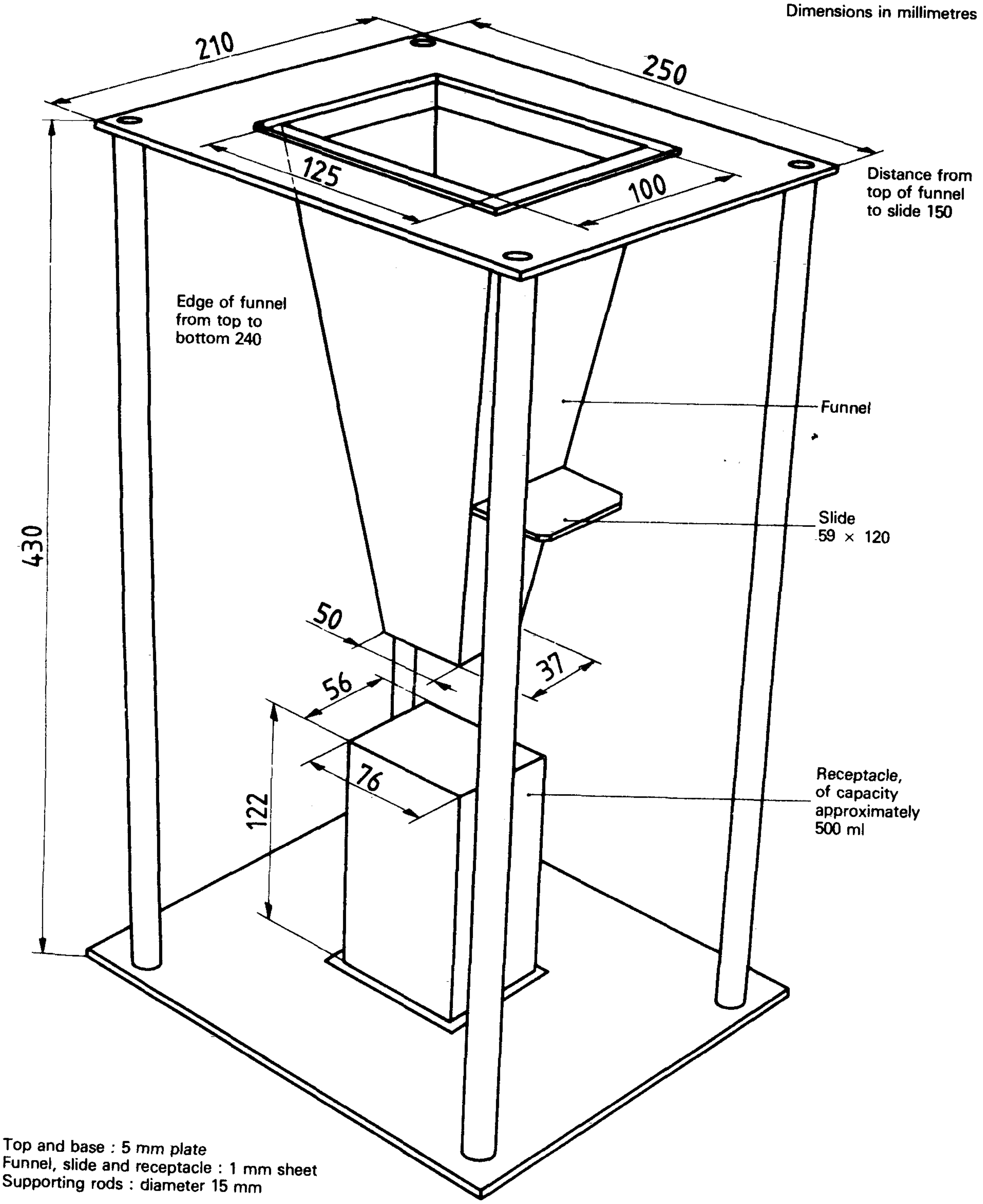
The difference between the values obtained in the two separate determinations (14.2), carried out in rapid succession by the same operator on the same test sample, shall not exceed 2 % of the mean.

16 Test report

The test report shall show the method used and the results obtained. It shall also mention any operating details not specified in this International Standard or regarded as optional, as well as any circumstances that may have influenced the result. It shall note, in particular, any lumps observed in the samples.

The test report shall include all the information necessary for the complete identification of the bulk sample.

Dimensions in millimetres


210
250
125
100
Distance from top of funnel to slide 150
Edge of funnel from top to bottom 240
430
Funnel
Slide 59 × 120
50
37
56
76
122
Receptacle, of capacity approximately 500 ml

Top and base : 5 mm plate
Funnel, slide and receptacle : 1 mm sheet
Supporting rods : diameter 15 mm

Figure 1 — Apparatus for determining free-flow bulk density

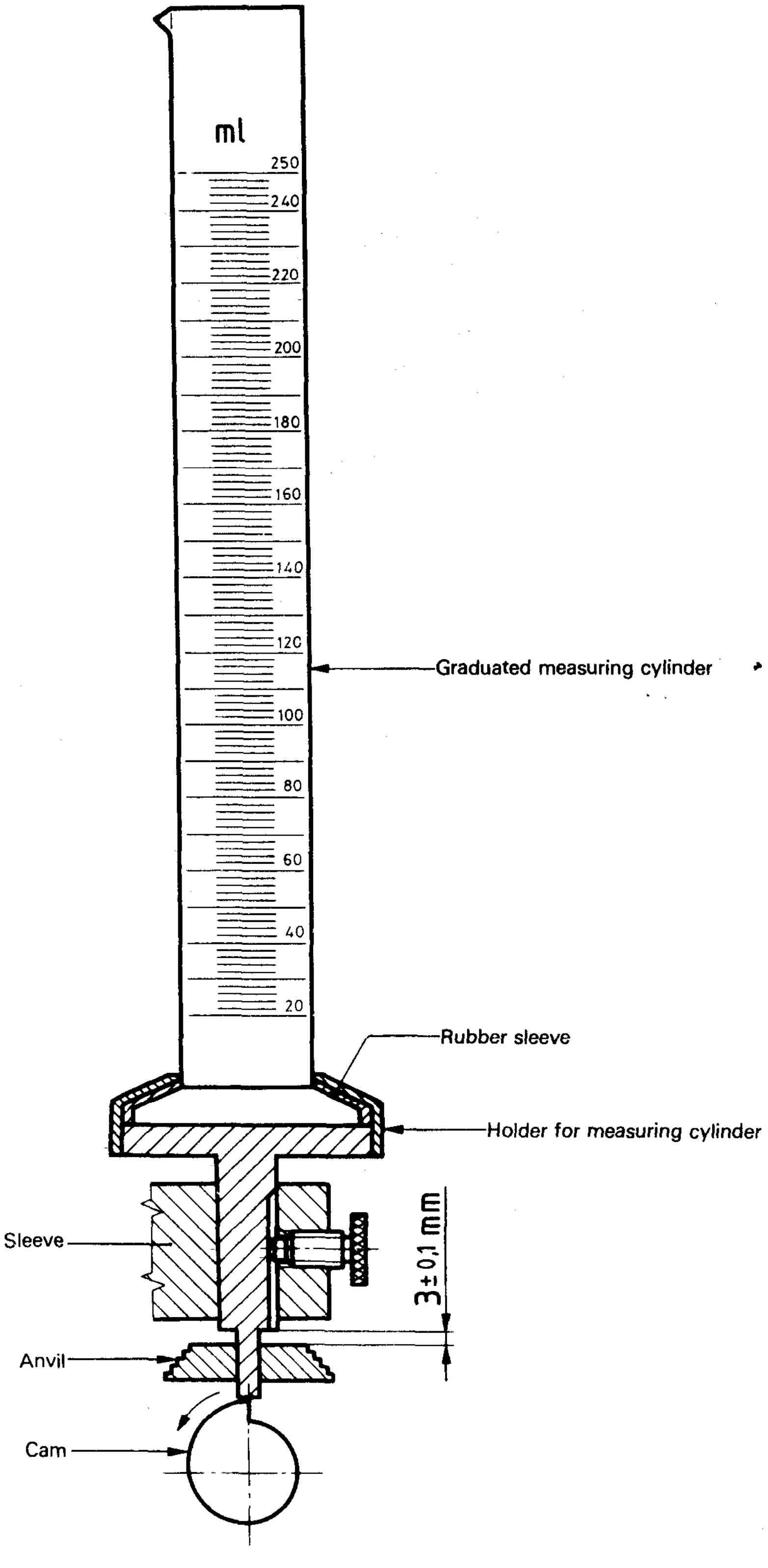


Figure 2 — Jogging volumeter

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